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(54) **COMPUTER SYSTEM INCLUDING MULTI-CHANNEL WIRELESS COMMUNICATION LINK TO A REMOTE STATION**

(76) Inventors: **Joseph Curley**, 9929 Jasmine Creek, Austin, TX (US) 78726; **Eric Swartzendruber**, 3009 Adam Cove, Round Rock, TX (US) 78681

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(52) **U.S. Cl.** **455/556.1**; 455/557; 455/41.3; 375/222

(58) **Field of Search** 455/556.1, 556.2, 455/557, 450, 452.1, 41.2, 41.3, 62, 434; 375/222; 370/338, 329

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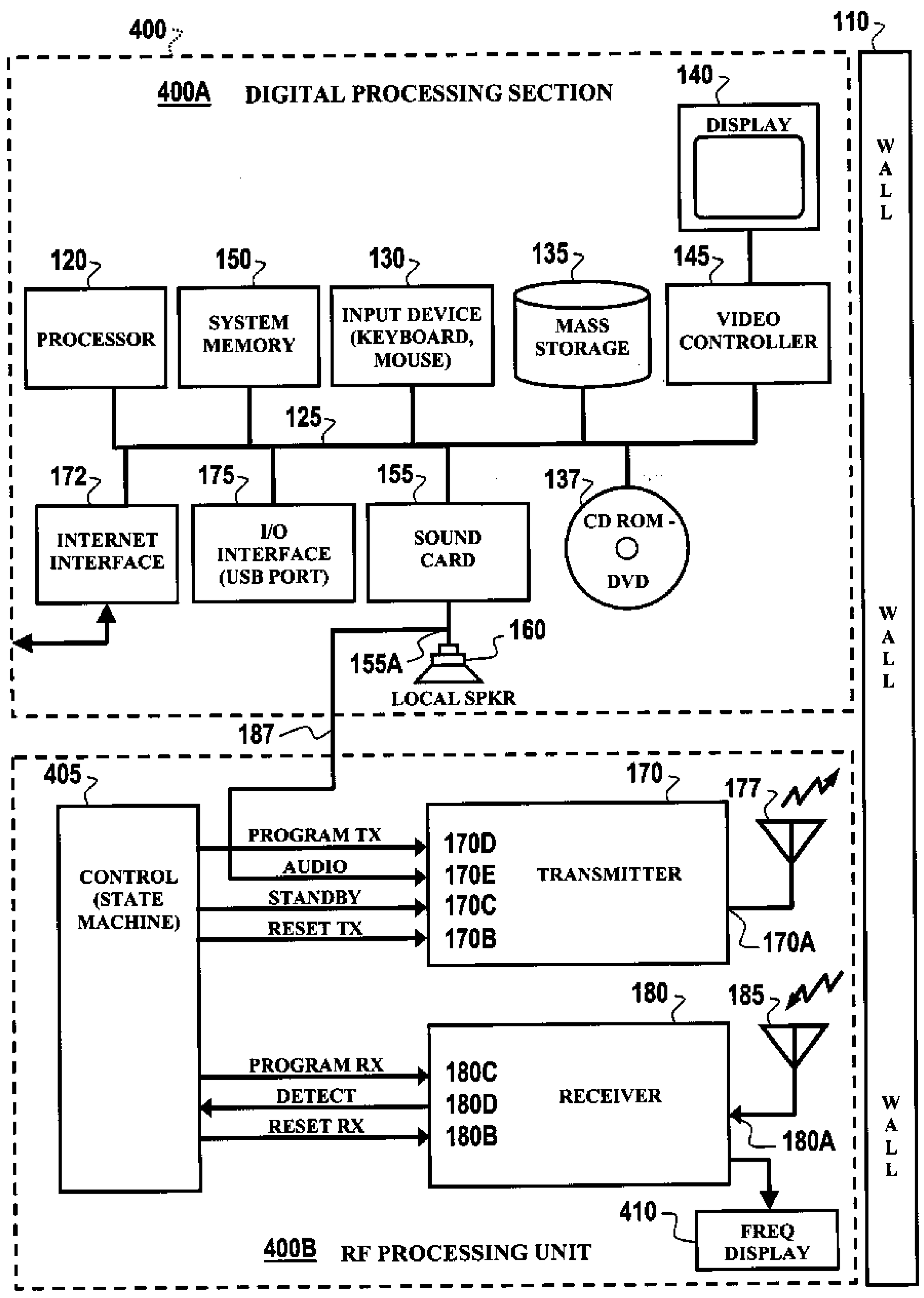
Primary Examiner—Lee Nguyen

(57) **ABSTRACT**

A computer system which is capable of transmitting information content through walls and other barriers to a remote station such as a home entertainment system. The system tests a plurality of radio frequency channels to locate a channel that is not in use. Channels that are in already in use are rejected to avoid interference with existing services. Once an unused channel is located, the computer system displays indicia of that channel to the user and transmits information content on the unused channel. The remote station receives the information content. In one embodiment, the remote station is a home entertainment system with audio amplifiers and speakers substantially larger and more powerful than those typically associated with computer systems such as personal and other computers. In this manner the audio and/or video qualities of the computer system are substantially enhanced by transmitting content to the remote system for presentation in an acoustically and/or visually enhanced environment.

18 Claims, 5 Drawing Sheets



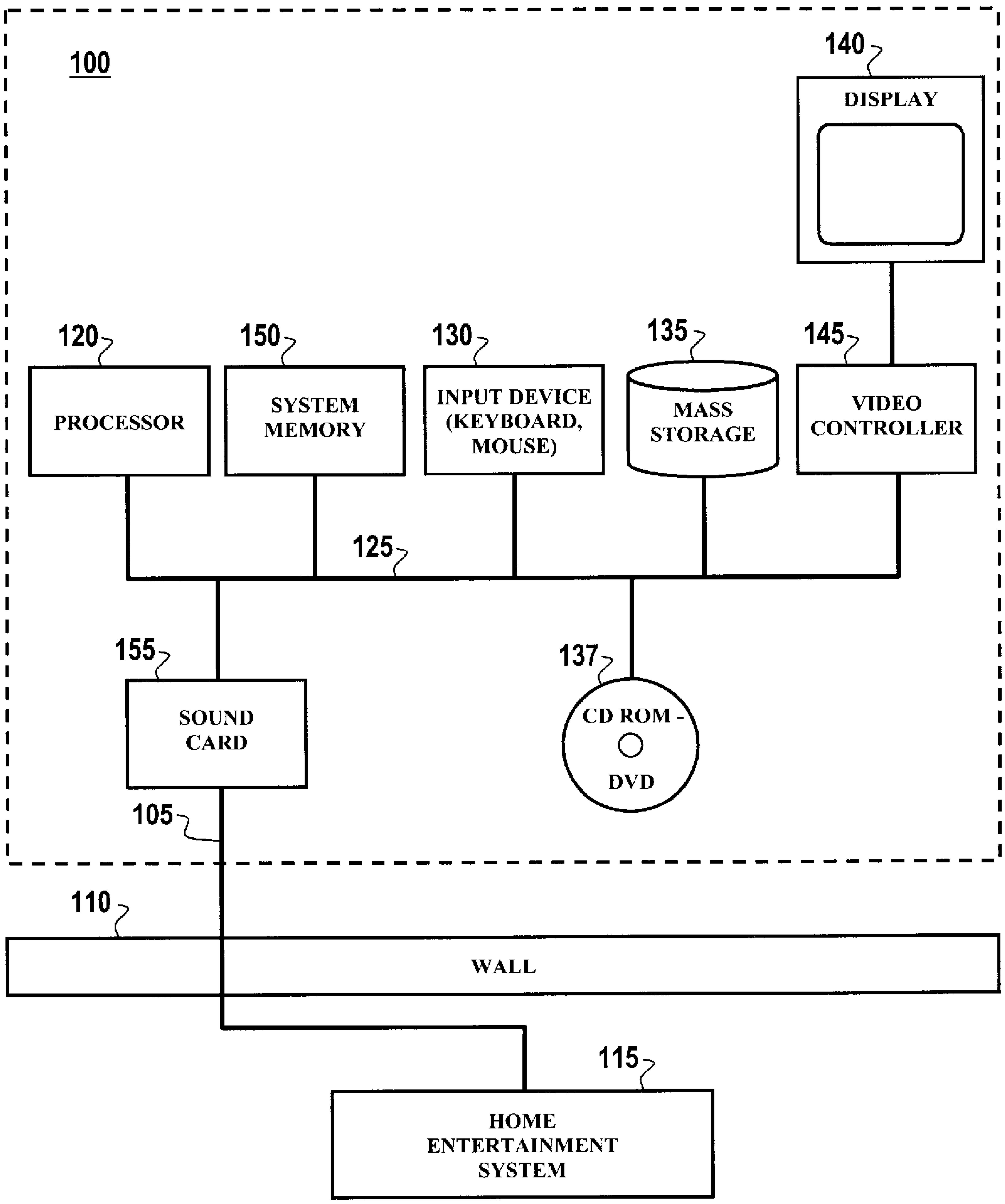
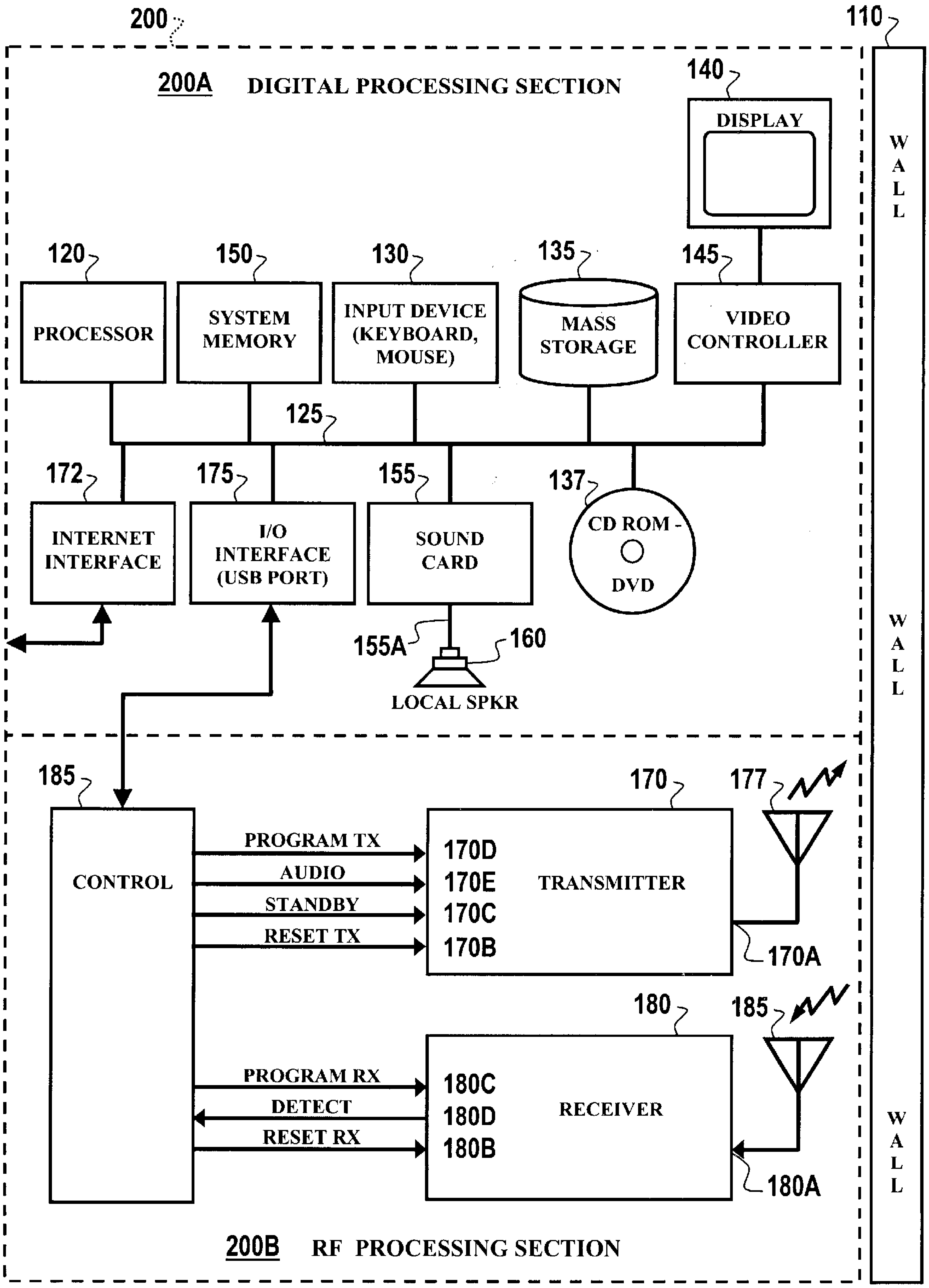


Fig. 1
(Prior Art)



200
110
200A DIGITAL PROCESSING SECTION
140
DISPLAY
W A L L
120
150
130
135
145
PROCESSOR
SYSTEM MEMORY
INPUT DEVICE (KEYBOARD, MOUSE)
MASS STORAGE
VIDEO CONTROLLER
125
172
175
155
137
INTERNET INTERFACE
I/O INTERFACE (USB PORT)
SOUND CARD
CD ROM - DVD
155A
160
LOCAL SPKR
W A L L
185
170
177
CONTROL
PROGRAM TX
AUDIO
STANDBY
RESET TX
170D
170E
170C
170B
TRANSMITTER
170A
180
185
PROGRAM RX
DETECT
RESET RX
180C
180D
180B
RECEIVER
180A
W A L L
200B RF PROCESSING SECTION

Fig. 2A

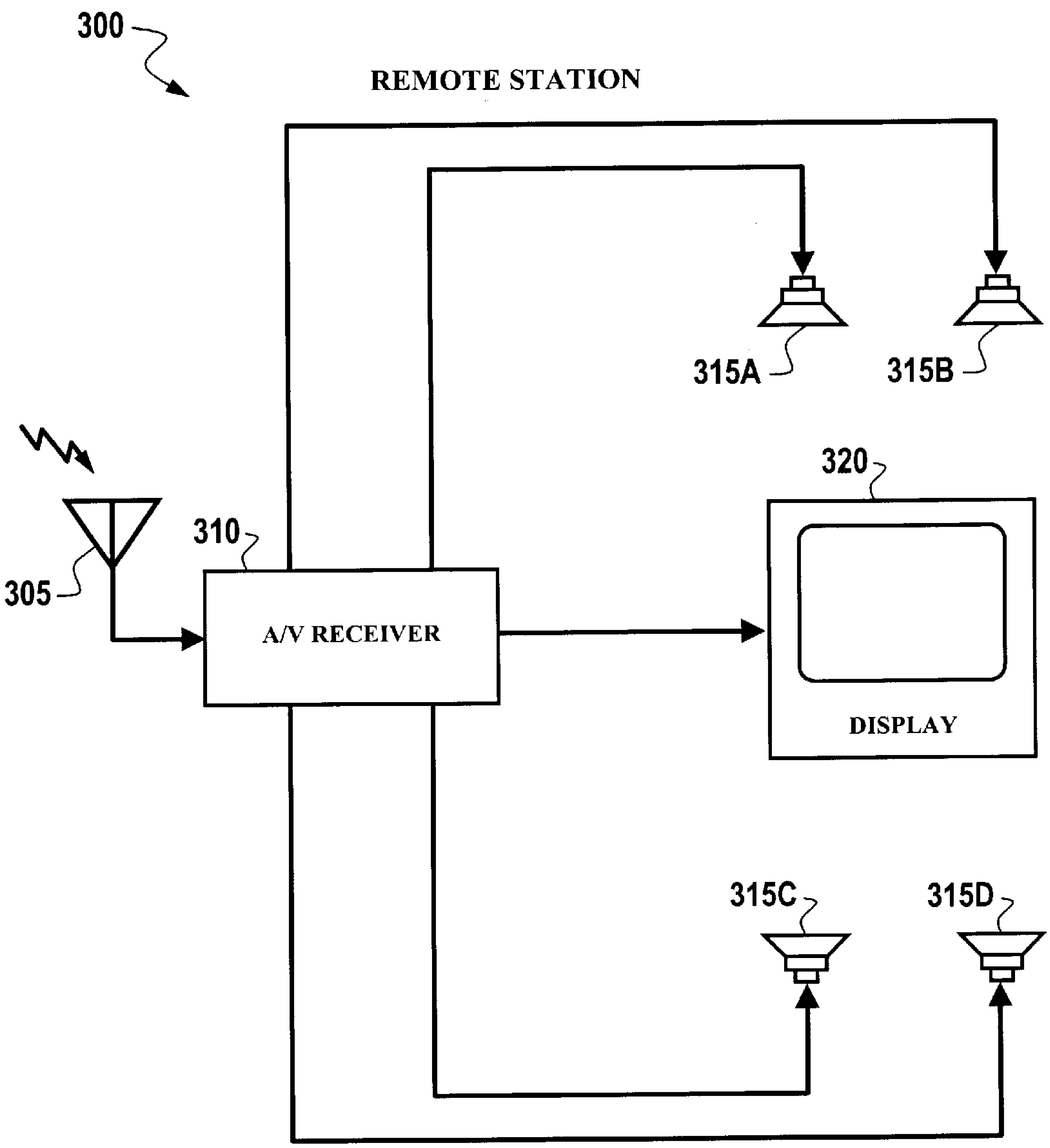

300
REMOTE STATION
315A
315B
320
310
305
A/V RECEIVER
DISPLAY
315C
315D

Fig. 2B

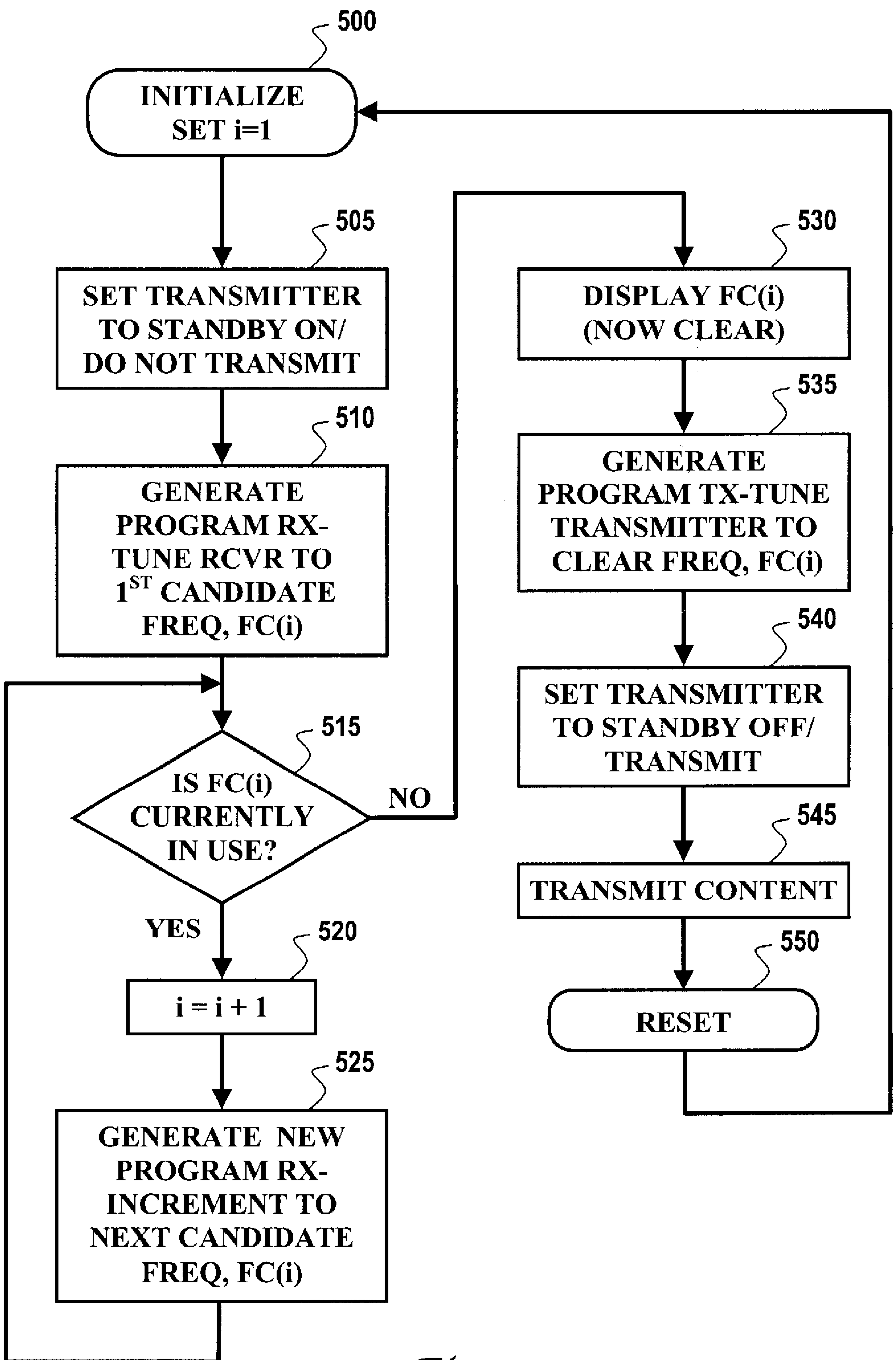

500
INITIALIZE
SET i=1
505
SET TRANSMITTER
TO STANDBY ON/
DO NOT TRANSMIT
510
GENERATE
PROGRAM RX-
TUNE RCVR TO
1ST CANDIDATE
FREQ, FC(i)
515
IS FC(i)
CURRENTLY
IN USE?
NO
YES
520
i = i + 1
525
GENERATE NEW
PROGRAM RX-
INCREMENT TO
NEXT CANDIDATE
FREQ, FC(i)
530
DISPLAY FC(i)
(NOW CLEAR)
535
GENERATE
PROGRAM TX-TUNE
TRANSMITTER TO
CLEAR FREQ, FC(i)
540
SET TRANSMITTER
TO STANDBY OFF/
TRANSMIT
545
TRANSMIT CONTENT
550
RESET

Fig. 3

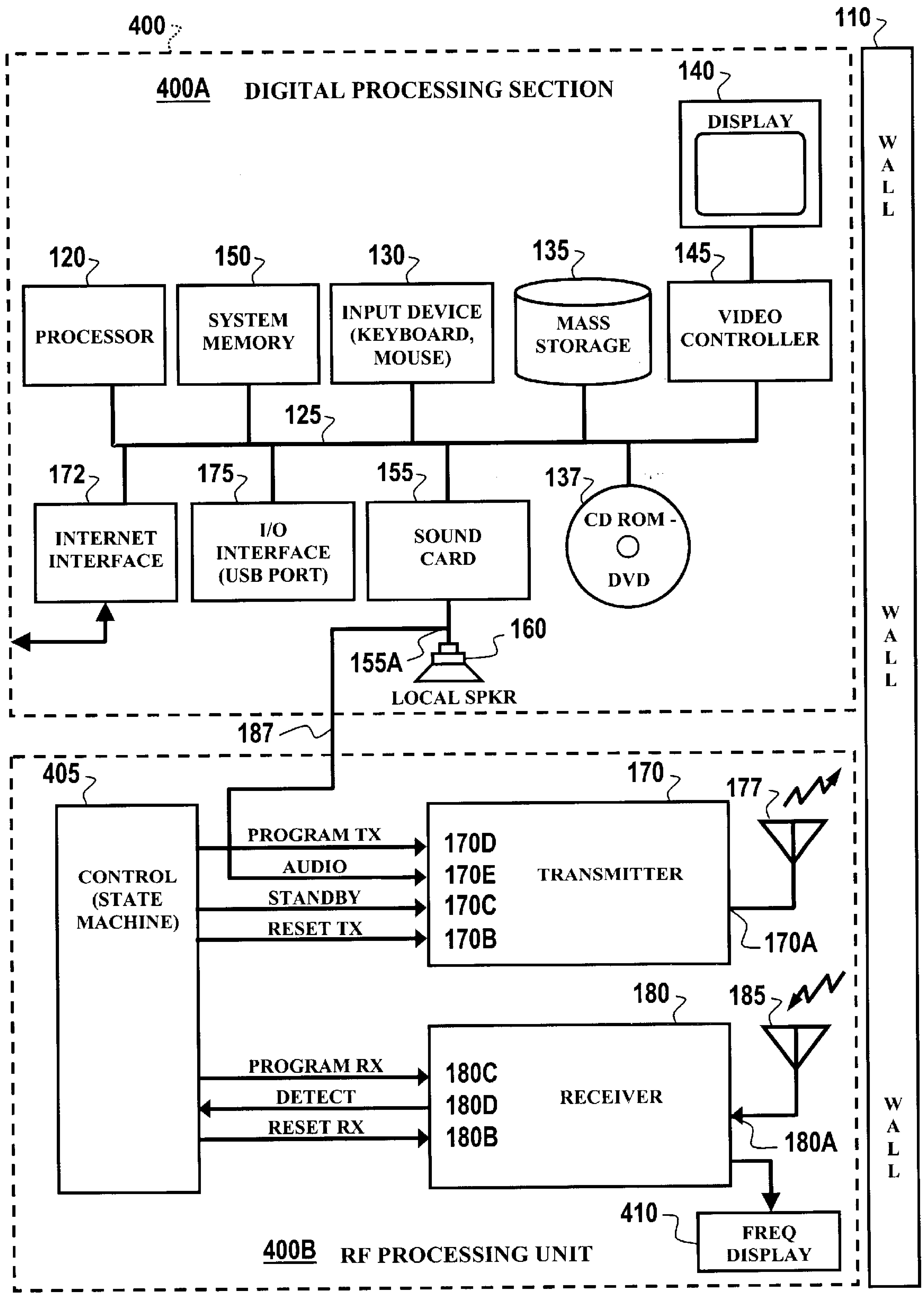

400
110
400A DIGITAL PROCESSING SECTION
140
DISPLAY
WALL
120
PROCESSOR
150
SYSTEM MEMORY
130
INPUT DEVICE (KEYBOARD, MOUSE)
135
MASS STORAGE
145
VIDEO CONTROLLER
125
172
INTERNET INTERFACE
175
I/O INTERFACE (USB PORT)
155
SOUND CARD
137
CD ROM - DVD
160
155A
LOCAL SPKR
WALL
187
405
CONTROL (STATE MACHINE)
170
177
PROGRAM TX
AUDIO
STANDBY
RESET TX
170D
170E
170C
170B
TRANSMITTER
170A
180
185
PROGRAM RX
DETECT
RESET RX
180C
180D
180B
RECEIVER
180A
WALL
410
FREQ DISPLAY
400B RF PROCESSING UNIT

Fig. 4

COMPUTER SYSTEM INCLUDING MULTI-CHANNEL WIRELESS COMMUNICATION LINK TO A REMOTE STATION

BACKGROUND

The disclosure herein relates generally to computer systems and more particularly to a computer system capable of communicating information signals to a remote location.

Many modern households include one or more personal computers. These personal computers are generally microprocessor-based, programmable electronic devices that store, process and retrieve data. The audio and graphics qualities of such computers have advanced substantially over time. However, these qualities can often be still further enhanced if the computer is connected to a home entertainment system. This is so because many home entertainment systems employ advanced speaker systems and displays that are generally substantially larger than those typically used with a personal computer. Many home entertainment systems include an audio video (A/V) receiver that provides AM, FM and video signal processing and audio amplification. These systems also often include a powerful multi-channel audio amplifier, multiple high quality audio speakers, a large display, a CD player, a digital versatile disk (DVD) player, and a videocassette recorder (VCR). Connecting a personal computer to such a home entertainment system can substantially enhance the computer user's experience.

Home entertainment systems and computers are often not located in close proximity to one another. The computer may be in one room and the home entertainment system may be in another room some distance away. This immediately presents a significant challenge to the user who desires to connect the computer to the home entertainment system to take advantage of the system's superior acoustic and video qualities. Running wires through existing walls and ceilings to connect a computer to a remote entertainment system can be difficult, time-consuming and expensive.

SUMMARY

The various embodiments of the present disclosure provide a computer system that is capable of wireless communication with a remote entertainment system; provide a computer system that communicates on a selected radio frequency with a remote entertainment system in a manner that does not cause interference to other services; and provide a computer system that avoids radio frequency (RF) channels already in use when selecting a channel for wireless RF communication with a remote entertainment system.

In accordance with one embodiment, a computer system is provided for communicating information content to a remote station. The computer system includes an RF processing section coupled to a digital processing section. The RF processing section includes a programmable channel receiver for receiving a plurality of radio frequency channels. The RF processing section further includes a programmable channel transmitter for transmitting information content on a selected channel. The digital processing section includes an information processor and a memory coupled to the information processor. The digital processing section further includes an information content source, coupled to the information processor, for supplying information content. The information processor instructs the programmable channel receiver to cycle through the plurality of radio frequency channels until an unused channel is found. Once an unused channel is found, the information processor instructs the programmable channel transmitter to transmit the information content on the unused channel which becomes the selected channel.

In accordance with another embodiment, a computer system is provided for communicating information content to a remote station. The computer system includes a digital processing section having an information processor and a memory coupled to the information processor. The digital processing section also includes an information content source, coupled to the information processor, for supplying information content. The computer system further includes an RF processing section coupled to the digital processing section. The RF processing section includes a channel programmable receiver for receiving a plurality of radio frequency channels and testing the plurality of radio frequency channels to find an unused channel. The RF processing section further includes a channel programmable transmitter, coupled to the information content source, for transmitting the information content on the unused channel.

BRIEF DESCRIPTION OF THE DRAWINGS

The features of the described embodiments believed to be novel are specifically set forth in the appended claims. However, embodiments relating to both structure and method of operation may best be understood by referring to the following description and accompanying drawings.

FIG. **1**, labeled PRIOR ART, is a block diagram illustrating a conventional computer system employing a wire connection through a wall to a remote home entertainment system.

FIG. **2**A is a schematic block diagram of one embodiment of the disclosed computer system.

FIG. **2**B is a schematic block diagram of a remote entertainment system capable of receiving information signals from the computer system of FIG. **2**A.

FIG. **3** is a flow chart illustrating the process flow implemented by the computer system of FIG. **2**A.

FIG. **4** is a schematic block diagram of another embodiment of the disclosed computer system.

DETAILED DESCRIPTION

Referring to FIG. **1**, a block diagram shows a conventional computer **100** connected by wire **105** through one or more walls **110** to a remote home entertainment system **115**. Computer **100** includes a processor **120** coupled to a bus **125**. For examples, a Pentium series microprocessor manufactured by Intel Corporation, a Power PC series microprocessor by Motorola or other processor can be used as processor **120**. Bus **125** servers as a connection between processor **120** and other components of computer **100**. Microsoft Windows, Apple Macintosh OS, Linux or other operating systems can be employed as the operating system for computer **100**. An input device **130** is coupled to processor **120** to provide input to processor **120**. Examples of input devices include keyboards, touchscreens, microphones, and pointing devices such as a mouse, trackball or trackpad. The operating system, programs and data are stored in a mass storage device **135**, which is coupled to processor **120** via bus **125**. Mass storage device **135** includes such devices as hard disks, optical disks, magneto-optical disks, floppy drives, CD-ROM drives, DVD drives and the like. An illustrative CD ROM/DVD drive **137** is shown coupled to bus **125** in FIG. **1**. Computer **100** further includes a display **140** that is coupled to processor **120** by a video graphics controller **145**. A system memory **150** is coupled to processor **120** to provide the processor with fast storage to facilitate execution of computer programs. It should be understood that other busses and intermediate circuits can be employed between the components described above and processor **120** to facilitate interconnection between the components and the processor. Bridge chips (not shown) are often used to couple the processor to one or more conventional buses such as the PCI (Peripheral Component Interconnect) bus, the USB bus (Universal Serial Bus), the PCMCIA/PC Card bus, the ISA (Industry Standard Architecture) bus, and the IEEE 1394 bus, for example. These busses facilitate connection of the computer to interface cards and peripherals. Microprocessor **120** is capable of executing application programs stored in mass storage **135**.

A sound card **155** is coupled to bus **125** to enable connection of computer **100** to external audio devices, such as local or remote audio speakers. Sound card **155** is connected via conductive wires **105** to a home entertainment system **115** in a location remote from computer system **100**. Considerable effort is required to drill holes in one or more walls **110** to permit sound card **155** to be connected to remote home entertainment system **115**. However, this effort is rewarded by the increased audio quality experienced by the listener. The listener experiences enhanced sonic quality because the amplifiers and speakers associated with most home entertainment systems are typically larger and more powerful than those generally employed by conventional computer systems. Unfortunately, drilling holes through walls or other barriers to establish a hard wire connection between the computer and the entertainment system is frequently not a reasonable option.

FIG. **2**A shows a computer system **200** for wirelessly transmitting audio or audio/video information signals to a remote station such as a remote home entertainment system, for example. In this particular embodiment, the system performs this transmission by modulating the audio information or content on a radio frequency carrier signal. Frequency modulation, amplitude modulation and phase modulation are examples of modulation techniques that may be employed. System **200** is capable of transmitting on a plurality of different radio frequency channels. Prior to transmission, the system checks a candidate radio frequency channel to assure that the channel is clear. In other words, computer system **200** checks to see if the candidate channel is unused or not busy. If the radio frequency channel is clear, then transmission commences. However, if system **200** finds that the candidate radio frequency channel is not clear, then the system moves to a different candidate frequency channel and repeats the test. New candidate channels are so tested until a clear radio frequency channel is located. In this manner, interference to services already occupying candidate radio frequency channels is avoided or substantially reduced.

Computer system **200** and its operation are now described in more detail. System **200** of FIG. **2**A contains some elements in common with computer **100** of FIG. **1** with like numbers indicating like elements. System **200** includes a digital processing section **200**A and a radio frequency (RF) processing section **200**B as illustrated. It is noted that the RF processing section can be integrated within the computer system. For example, the RF processing section can be situated within the same chassis or enclosure as the digital processing section. Alternatively, the RF processing section can be a separate module or standalone device that is coupled to the digital processing section.

An embodiment wherein RF processing section **200**B is integrated with respect to digital processing section **200**A is now discussed with reference to FIG. **2**A. A sound card **155** is coupled to bus **125** of system **200** to provide audio to a local speaker system **160**. Sound card **155** may have one (monaural), two (stereo), or more channel audio outputs indicated collectively as **155**A. An example of one sound card that can be employed as sound card **155** is the SoundBlaster 64 v PCI card manufactured by Creative Technology Ltd. Audio content for sound card **155** can be retrieved from mass storage **135**, CD ROM/DVD **137**, from the Internet interface **172** or may be generated by computer system **200** itself. Devices that can be employed as Internet interface **172** include cable modems, DSL modems, ISDN modems, as well as dial-up and wireless modems, for example. The internet interface **172** advantageously provides system **200** with audio and video content beyond that generated by system **200** or stored in system **200** at mass storage **135** or CD/DVD drive **137**.

Digital processing section **200**A includes an I/O interface **175** coupled between bus **125** and RF processing section **200**B to provide audio or audio/video content to RF processing section **200**B. RF processing section **200**B is given the task of transmitting this content to a remote entertainment system. A data stream including audio or audio/video is communicated to RF Processing section **200**B via I/O interface **175**. The data stream can include analog information, digital information or a combination of analog and digital information. Control commands from digital processing section **200** are also conveyed across interface **175** to enable digital processing section **200**A to control the operation of RF processing section **200**B in this embodiment. Responsive status information such as candidate frequency availability is communicated from RF processing section **200**B back to digital processing section **200**A via I/O interface **175**. One type of interface that can be employed as interface **175** is a Universal Serial Bus (USB) interface. Other interfaces such as serial, parallel and IEEE 1394 could be employed as well.

RF processing section **200**B includes a transmitter **170**, a receiver **180** and a control circuit **185** through which digital processing section **200**A controls the operation of transmitter **170** and receiver **180**. A digital audio data stream (content) is fed through I/O interface **175** to control circuit **185** which supplies a corresponding analog audio signal to transmitter **170** for transmission. This analog signal is designated AUDIO although it may contain video content as well. An embodiment is also contemplated wherein this content signal provided to transmitter **170** is digital audio or digital audio/video. Control circuit **185** includes a RESET TX port that is coupled to transmitter input **170**B to reset the transmitter on command from digital processing section **200**A. The operating frequency of transmitter **170** is programmable. Control circuit **185** includes a PROGRAM TX port that is coupled to transmitter input **170**D to set the operating frequency of transmitter **170**. A PROGRAM TX signal is generated by control circuit **185** under program control of digital processing section **200**A to set the operating frequency of transmitter **170**. In this manner, a control program executed in digital processing section **200**A sets the frequency of transmitter **170**.

Control circuit **185** further includes a RESET RX port that is coupled to receiver input **180**B to enable the control program to reset receiver **180**. Control circuit **185** also includes a PROGRAM RX port that is coupled to receiver input **180**C to enable the control program to set the operating frequency of receiver **180**. The operating frequency of receiver **180** is programmable and is referred to as the candidate operating frequency while such frequencies are being tested for usability. Computer system **200** tests candidate frequencies until an unused frequency is found which is available for use by system **200** to transmit content to a remote entertainment system. Receiver input **180**A is coupled to an antenna **185** and transmitter output **170**A is coupled to an antenna **177**. In this particular embodiment, receiver **180** is programmable to receive all channels within the standard broadcast FM band, namely 88 MHz to 108 MHz. Transmitter **170** is programmable to transmit on any channel within the 88 MHz to 108 MHz FM band. Of course, other bands and channels can be used as desired according to the particular application.

In this embodiment a control program is stored in mass storage **135** to govern the selection of a radio frequency channel for system **200**. Receiver **180** and transmitter **170** are thus said to be under program control as will be discussed in more detail subsequently. When system **200** is powered up, processor **120** is initialized to commence system operation. After the operating system loads, the radio frequency control program stored in mass storage **135** is loaded and begins to control the operation of receiver **180** and transmitter **170**. Receiver **180** and transmitter **170** are both reset. More particularly, receiver **180** is reset when control circuit **185** provides a RESET RX signal to the reset input **180**B of receiver **180**. Transmitter **170** is reset when control circuit **185** provides a RESET TX signal to the reset input **170**B of transmitter **170**. The control program executed by digital processing section **200**A then instructs control circuit **185** to generate a PROGRAM RX signal which programs receiver **180** to listen to a first candidate frequency, for example 88.1 MHz. The PROGRAM RX signal is provided to input **180**C of receiver **180**. The first candidate frequency is then tested to see if it is already in use; i.e. a test is conducted to determine if a signal is already present at the candidate frequency.

To facilitate this signal presence test, a Motorola MC13156 FM demodulator is employed in receiver **180** in this particular embodiment. This demodulator includes a DETECT pin **180**D which changes state when a signal is detected at the programmed frequency of operation. When receiver **180** receives a signal at the frequency set by the PROGRAM RX signal, the DETECT signal at output **180**D goes high. However, if the frequency were unused, i.e. the frequency is not occupied by a significant signal, then the DETECT signal remains low. The DETECT signal is fed back to digital processing section **200**A via control circuit **185** and USB interface **175** to provide information to processor **120** indicating whether or not the selected radio frequency is in use or busy. In this example, receiver **180** detects a significant signal at the first candidate radio frequency and thus the frequency is found to be already in use. Under these conditions transmission is not desired. Digital processing section **200**A instructs control circuit **185** to keep the STANDBY signal at transmitter input **170**C in the inactive state to maintain transmitter **170** in standby mode. The AUDIO signal provided to transmitter input **170**E is thus not transmitted. Digital processing section **200**A now operates under program control to cause control circuit **185** to change the PROGRAM RX signal provided to receiver input **180**C signal to correspond to a second candidate frequency, 88.3 MHz. In short, we increment to a second candidate frequency and test again to determine if the frequency is in use.

In this example, it is assumed that the second candidate frequency is not in use. Thus, receiver **180** receives no significant signal when it tests the second candidate frequency and the DETECT signal goes low. In response, digital processing section **200**A operates under program control to cause control circuit **185** to shift the transmit frequency to the second candidate frequency, 88.3 MHz, which was found not to be in use. More particularly, control circuit **185** sends transmitter input **170**D a PROGRAM TX signal corresponding to the second candidate frequency. Under program control the control circuit **185** now changes the STANDBY signal provided to transmitter input **170**C to an active state causing transmission to commence. The audio content provided to transmitter input **170**E is thus transmitted at the second candidate frequency, 88.3 MHz because it was found to be clear.

If the second candidate radio frequency or channel had been busy, digital processing section **200**A would continue the search for an unused RF channel until an unused channel was found. Because the second candidate frequency has been selected for transmission, the second candidate frequency is now displayed on display **140** to inform the user as to which frequency the remote station **300** of FIG. **2**B should be tuned to receive the content transmission.

As illustrated in FIG. **2**B, one version of remote station **300** includes a receiving antenna **305** that is coupled to an input of audio/video (A/V) receiver **310**. Front left speaker **315**A, front right speaker **315**B, rear left speaker **315**C and right rear speaker **315**D are coupled to respective audio outputs of AN receiver **310**. While this particular version includes four audio outputs and speakers, a lesser or greater number of speakers can be employed according to the particular application. A/V receiver **310** includes an FM tuner. As mentioned earlier, when system **200** selects a clear radio frequency channel on which to transmit, the frequency or other identifying indicia of this channel (e.g. a channel number) is displayed on display **140**. In this manner, the user is informed as to which frequency the FM tuner in A/V receiver **310** should be tuned. The audio content which is modulated on the transmitted RF signal is demodulated by receiver **310**, amplified by an audio amplifier in receiver **310** and fed to speakers **315**A–**315**D. Content from computer system **200** is thus wirelessly transmitted through one or more walls **110** or other barriers to remote station **300**. Remote station **300** is also referenced herein as an entertainment system, specifically a remote entertainment system. Entertainment system **300** is remote from computer system **200** in that it is separated from computer system **200** by some distance that is traversed by the wireless transmissions described herein.

It should be noted that in actual practice antennas **177** and **185** can be implemented as a single antenna by providing receiver **180** and transmitter **170** with appropriate transmit-receive (TR) switching circuitry.

FIG. **3** is a flowchart describing the operation of the aforementioned control software or control program that is stored in mass storage **135** to provide program control for computer system **200**. The control software, when executed by processor **120**, controls the operation of system **200** of FIG. **2**A as it seeks out a clear radio frequency channel on which to transmit content to remote station **300** of FIG. **2**B. Process flow is now described with reference to FIG. **3**. The system is initialized as per block **500** and a counter "i" is set to an initial value of 1. Digital processing section **200**A instructs control circuit **185** to generate a STANDYBY signal with a low state to set transmitter **170** to the "standby" state as per block **505**. Then, as per block **510**, digital processing section **200**A then instructs control circuit **185** to generate a PROGRAM RX signal which causes programmable receiver **180** to be tuned to the first candidate frequency channel, FC(**1**) wherein i=1. In one example, the frequency of channel **1**, namely FC (**1**), is 88.1 MHz. A test is now conducted as per decision block **515** to determine if the first candidate frequency channel FC(**1**) is already in use. If receiver **180** finds a signal on the first candidate frequency FC(**1**), then the DETECT signal returned to digital processing section **200**A via control circuit **185** exhibits a value indicating that the frequency is in use. In contrast, if receiver **180** finds no substantial signal at the first candidate frequency FC(**1**), then a DETECT signal indicating a free channel is returned to digital processing section **200**A.

For example purposes however, assume that a signal is received at the first candidate frequency FC(**1**). Digital processing section **200**A tests the DETECT signal and determines that the first candidate frequency FC(**1**) is indeed busy as per decision block **515**. The counter "i" is now incremented by 1 as per block **520**. Digital processing section **200**A changes the candidate frequency FC (i) to the next candidate frequency, for example, 88.3 MHz as per block **525**. To perform this operation, digital processing section **200**A instructs control circuit **185** to change the PROGRAM RX signal to a value corresponding to the next candidate frequency, Fc(**1**). In response, receiver **180** is then tuned to a channel corresponding to this new candidate frequency.

A test is now conducted at decision block **515** to determine if the new candidate frequency is in use. In this example, it is determined that the new candidate frequency is not in use, but rather is available for transmission. Process flow now continues to block **530** at which this new candidate frequency, Fc(**1**) (for example, 88.3 MHz) is displayed to the user on display **140**. In this manner, the user knows to which frequency the remote station **300** should be tuned to receive content from system **200**. As per block **535**, digital processing section **200**A instructs control circuit **185** to generate a PROGRAM TX signal to tune transmitter **170** to the candidate frequency, Fc(**1**), which was found to be clear for use. Digital processing section **200**A then instructs control circuit **185** to generate a STANDBY signal with an active state to turn on transmitter **170** at block **540** and commence transmission of content at block **545**. If the user desires to reset the system, the user initiates a reset by an appropriate mouse click selection on display **140** as indicated at block **550**. Process flow then goes back to block **500** and the system is re-initialized.

FIG. **4** shows another embodiment of the computer system as system **400**. Like system **200** discussed earlier, system **400** includes both a digital processing portion and an RF processing portion. However, in this particular embodiment, RF processing unit **400**B is a unit that is physically separate from digital processing section **400**A. RF processing unit **400**B and digital processing section **400**A are not integrated in the same chassis, although such integration is contemplated in yet another embodiment.

It will be noted that digital processing section **400**A and RF processing unit **400**B have similarities to sections **200**A and **200**B, respectively of FIG. **2**A, with like numbers indicating like elements. However, in system **400** an analog audio line **187** connects sound card output **155**A to AUDIO transmitter input **170**E. In this manner, content is provided to transmitter **170** for transmission to a remote station or entertainment system. It will be recalled that in system **200** of FIG. **2**A, digital processing section **200**A controlled frequency selection and channel testing. In contrast, in the system **400** embodiment of FIG. **4**, RF processing unit **400**B controls the frequency selection and testing.

RF processing unit **400**B includes a control circuit **405** having a state machine therein which controls the operation of RF processing unit **400**B. Control circuit **405** and the state machine therein implement substantially the same control operations and functions as described earlier in the flow chart of FIG. **3**. The difference is that RF processing unit **400**B carries out these control operations and functions of the FIG. **3** flowchart in a substantially standalone manner independent of digital processing section **400**A. More particularly, control circuit **405** and its state machine generate the PROGRAM TX, STANDBY, RESET TX, PROGRAM RX, AND RESET RX signals that control candidate frequency selection and testing. Control circuit **405** and its state machine implement substantially the same steps called out in the flowchart FIG. **3**. In this manner each candidate frequency is programmed into receiver **170** and tested to determine if it is in use before transmission of content is permitted.

In more detail, operation commences after system initialization with control circuit **405** generating a STANDBY signal which puts transmitter **170** in a standby state until a clear frequency channel is found. Control circuit **405** then generates an appropriate PROGRAM RX signal to set receiver **180** to a first candidate frequency. For discussion purposes it is assumed that the first candidate frequency is already in use by another service. Consequently, a signal is detected on the first candidate frequency and the DETECT signal goes high. The state machine recognizes the high DETECT signal and causes the control circuit to change the PROGRAM RX signal to a value which instructs receiver **180** to move to a second candidate frequency. To further our discussion it is assumed that the second candidate frequency is not in use. Because no signal is detected by the receiver, the DETECT signal goes low. The state machine responds to the DETECT signal going low and control circuit **405** generates a PROGRAM TX signal which instructs transmitter **170** to tune to the second candidate frequency in preparation for transmitting the content. Control circuit **405** then changes the state of the STANDBY signal to the active state to turn on transmitter **170** to commence transmission of the content. A display **410** is coupled to receiver **180** to display the frequency of the transmitted signal. In this manner, the user is informed of the frequency channel that is determined to be clear. The user then tunes the receiver of the remote entertainment system to the clear channel to receive the transmitted content.

From the above discussion it should be understood that the function of moving from candidate frequency channel to candidate frequency channel and testing each channel to determine if it is already in use can be controlled by software, namely the control program already discussed with respect to system **200** of FIG. **2**. Alternatively, this functionality can be implemented by equivalent hardware such as that of RF processing unit **400**B in system **400** of FIG. **4**.

The foregoing has described a computer system that is capable of wireless communication with a remote entertainment system. Advantageously, the computer system communicates on a selected radio frequency channel with a remote entertainment system in a manner that does not cause interference to other services. The problem of connecting a computer to a remote entertainment system when there are one or more barriers between the computer and the entertainment system is solved by the disclosed computer system. The computer system also solves the problem of connecting a computer system to a remote entertainment system in the same room when it is not convenient or desirable to connect the computer system to the entertainment system with conventional wires.

While various embodiments have been described, it will be understood that these embodiments are illustrative and that many variations, modifications, additions and improvements of the embodiments described are possible. For example, it should be understood that the disclosed computer system is not limited to operating on the particular frequency band discussed in the examples above. Rather, other bands of higher or lower frequency can be employed as well. Moreover, the computer system is not limited to FM, but can be employed with other modulation methods such as AM, phase modulation, single sideband and double sideband, for example. While the particular embodiments discussed provide for transmission of audio content, it will be appreciated that the disclosed techniques can also be used to transmit video on an unused candidate channel or to transmit a combination of audio and video on an unused channel. Additional bandwidth may be required for channels in such applications. Those skilled in the art will readily implement the steps necessary to provide the structures and methods disclosed herein, and will understand that the process parameters, materials, and dimensions are given by way of example only and can be varied to achieve the desired structure as well as modifications which are within the scope of the embodiments disclosed herein. Variations and modifications of the embodiments may be made based on the description set forth herein, without departing from the scope and spirit of the embodiments as set forth in the following claims.

What is claimed is:

1. A computer system for communicating information content to a remote station, the computer system comprising:

an RF processing section coupled to a digital processing section;

the RF processing section including:

a programmable channel receiver for receiving a plurality of radio frequency channels;

a programmable channel transmitter for transmitting information content on a selected channel; and

a control means for enabling the digital processing section to reset the transmitter and receiver and for setting transmitting and receiving operating frequencies;

the digital processing section including:

an information processor;

a memory coupled to the information processor;

an information content source, coupled to the information processor, for supplying information content; and

the information processor instructing the programmable channel receiver to cycle through the plurality of radio frequency channels until an unused channel is found, the information processor then instructing the programmable channel transmitter to transmit the information content on the unused channel which becomes the selected channel.

2. The computer system of claim **1** wherein the digital processing section and the RF processing section share a common chassis.

3. The computer system of claim **1** wherein the RF processing section is configured as a standalone unit with respect to the digital processing section.

4. The computer system of claim **1** further comprising a USB connection between the digital processing section and the RF processing section.

5. The computer system of claim **1** wherein the channel programmable receiver and the programmable channel transmitter employ frequency modulation.

6. The computer system of claim **1** wherein the channel programmable receiver and the programmable channel transmitter employ amplitude modulation.

7. A computer system for communicating information content to a remote station, the computer system comprising:

a digital processing section including:

an information processor;

a memory coupled to the information processor; and

an information content source, coupled to the information processor, for supplying information content; and

an RF processing section, coupled to the digital processing section, including:

a channel programmable receiver for receiving a plurality of radio frequency channels and testing the plurality of radio frequency channels to find an unused channel;

a channel programmable transmitter for transmitting the information content on the unused channel; and

a controller for enabling the digital processing section to reset the transmitter and receiver and for setting transmitting and receiving operating frequencies.

8. The computer system of claim **7** wherein the RF processing section is configured as a standalone unit with respect to the digital processing section.

9. The computer system of claim **7** wherein the digital processing section and the RF processing section share a common chassis.

10. The computer system of claim **7** wherein the channel programmable receiver and the channel programmable transmitter employ frequency modulation.

11. The computer system of claim **7** wherein the channel programmable receiver and the programmable channel transmitter employ amplitude modulation.

12. A computer system for communicating information content to a remote station, the computer system comprising:

an information processor;

a memory coupled to the information processor;

an information content source, coupled to the information processor, for supplying information content;

a channel programmable receiver, coupled to the information processor, for receiving a plurality of radio frequency channels;

testing means, coupled to the receiver, for testing the plurality of radio frequency channels to find an unused channel;

a channel programmable transmitter, coupled to the information content source, for transmitting the information content on the unused channel; and

means for resetting the transmitter and receiver and for setting transmitting and receiving operating frequencies.

13. The computer system of claim **12** wherein the channel programmable receiver and the programmable channel receiver employ frequency modulation.

14. The computer system of claim **12** wherein the channel programmable receiver and the programmable channel transmitter employ amplitude modulation.

15. A method of communicating an information content signal from a computer system to a remote station comprising:

programming a receiver to receive a plurality of candidate frequency channels;

testing the candidate frequency channels until an unused candidate frequency channel is found;

programming a transmitter to transmit on the unused candidate frequency channel found in the testing step;

transmitting the information content from the computer system on the unused candidate frequency channel;

resetting the transmitter and receiver; and

setting transmitting and receiving operating frequencies.

16. The method of claim **15**, further comprising receiving the information content signal by the remote station.

17. A method of communicating an information content signal from a computer system to a remote station wherein the computer system includes a digital processing section and a RF processing section, the method comprising:

the digital processing section instructing the RF processing section to receive a candidate frequency channel;

the RF processing section receiving the candidate radio frequency channel the RF processing section providing a channel availability signal to the digital processing section;

the digital processing section continuing to instruct the RF processing section to receive different candidate frequency channels until an unused candidate frequency channel is found as indicated by the channel availability signal; and

the RF processing section including:

a control means for enabling the digital processing section to reset the transmitter and receiver and for setting transmitting and receiving operating frequencies.

18. The method of claim **17** further comprising the digital processing section instructing the RF processing section to transmit the information content signal on the unused candidate frequency channel indicated by the channel availability signal.

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